F. GENERIC BRANDS (continued)

| | |
|---|---|
| KING SIZE LIGHTS MENTHOL 85 | |
| Distributor unknown - manufactured by U.S. Tobacco Co. | 6/81 |
| LIGHTS 85 (WHITE PACK) | |
| Distributed by Compass Foods - manufactured by Liggett Group. | 4/81 |
| LIGHTS 85 (YELLOW PACK) | |
| Distributed by Sun Fresh, Inc. - manufactured by Liggett Group. | 6/81 |
| PRICEBREAKER LIGHTS 85 | |
| Distributed by Economy Wholesale - manufactured by Liggett Group. | 7/82 |
| PRICEBREAKER LIGHTS MENTHOL 85 | |
| Distributed by Economy Wholesale - manufactured by Liggett Group. | 7/82 |
| PRICEBREAKER LIGHTS 100 | |
| Distributed by Economy Wholesale - manufactured by Liggett Group. | 7/82 |
| QUALITY ULTRA LIGHTS 85 | |
| Distributed by Gary Tobacco Co. - manufactured by Liggett Group. | 3/83 |
| QUALITY ULTRA LIGHTS 100 | |
| Distributed by Gary Tobacco Co. - manufactured by Liggett Group. | 3/83 |
| SCOTCH BUY LIGHTS 85 | |
| Distributed by Safeway Stores - manufactured by Liggett Group. | 5/81 |
| WORTH LIGHTS 85 | |
| Distributed by the Pantry Inc. - manufactured by Liggett Group. | 9/84 |

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F. GENERIC BRANDS (continued)

WORTH LIGHTS MENTHOL 85

Distributed by the Pantry Inc. - manufactured by Liggett Group. 9/84

YOURS FILTER LIGHTS 85

Distributed by Gary Tobacco Co. - manufactured by Liggett Group. 5/83

YOURS FILTER LIGHTS MENTHOL 85

Distributed by Gary Tobacco Co. - manufactured by Liggett Group. 5/83

YOURS FILTER LIGHTS 100

Distributed by Gary Tobacco Co. - manufactured by Liggett Group. 5/83

YOURS FILTER LIGHTS MENTHOL 100

Distributed by Gary Tobacco Co. - manufactured by Liggett Group. 5/83

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# DESCRIPTION OF REPORTED DATA

All values reported are basically running averages of four monthly samplings, except for reconstituted tobacco, floated material, and expanded stem levels, which are determined on a semiannual basis.

Every brand is tested each month for FTC tar and nicotine deliveries; the mentholated brands are tested each month for menthol in smoke, filler, and filter. Therefore, the running average for these characteristics covers an interval of four months. Other characteristics are determined once every four months, so the running average represents a period of one year. In the months when a characteristic is not measured, the value reported is from the preceding month.

Generally, the value reported is an average of four samplings. When a change has been detected and confirmed, the reported values may consist of one value or an average of two or three values, and are shown in parentheses.

The minor brands are examined at least twice a year for FTC tar, nicotine, total RTD, and filter type.

Data appearing on the graphs represent the average of the four monthly samplings.

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## I. SAMPLING

The freshest cigarettes are obtained from two jobbers in ten major cities (Richmond, Virginia; Washington, D.C.; New York, New York; Louisville, Kentucky; Durham, North Carolina; Atlanta, Georgia; St. Louis, Missouri; New Orleans, Louisiana; Dallas, Texas; and Chicago, Illinois). Two cartons are requested from each jobber for a complete C.I. One carton is obtained from each jobber for supplemental C.I. analyses. The most current date of manufacture is used for C.I. analyses. The total number of cartons used never exceeds ten.

Eight packs from each carton are opened, and the cigarettes are equilibrated to standard conditions; i.e., 75°F and 60% R.H. for at least 24 hours. After the cigarettes have been equilibrated random samples are taken for analyses. Samples are selected so that carton to carton differences can be determined; thus, each carton within a given brand is considered as an individual sample. Only average values obtained from the total sample are incorporated in the C.I. Report. However, the individual carton values are important for noting possible changes within a given brand.

Cigarettes for menthol analysis are taken immediately after the packs are opened and placed in sealed containers; thus, the menthol content of the filler, filter, and smoke are determined from unequilibrated cigarettes.

## II. CIGARETTE PERFORMANCE

### A. Smoke Characteristics

#### 1. FTC Tar

FTC Tar is defined as TPM minus water minus nicotine smoked to a 23 mm butt or tipping plus 3 mm (whichever is the longer).

#### 2. TPM

Total particulate matter (TPM), smoke particles larger than 0.3 micron, is determined by smoking cigarettes on a twenty-port constant volume smoking machine which provides a 35 milliliter (ml) puff of two seconds duration once each minute. The TPM, including nicotine, is collected on Gelman disposable filter pads which are weighed before and after smoking five cigarettes (one port) to a 23 millimeter butt length or tipping paper plus 3 mm (whichever is the longer). A total of 12 ports (60 cigarettes) are smoked per sample each month.

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### 3. Nicotine and Water in TPM

Nicotine and water in TPM are determined simultaneously by gas chromatography of an isopropanol extract. Samples are compared to standards of known nicotine and water concentration. Carvone and ethanol are used as internal standards for nicotine and water, respectively, in the extracting solution to eliminate instrumental variation. For nicotine and water determination in TPM, twelve ports are smoked for each brand as described in Section II.A.2. Two TPM pads are combined in a test tube and extracted in the isopropanol extracting solution. The extracts are then analyzed on a gas chromatograph. Sample injection, chromatogram analysis, and data manipulation are automated. Data are reported on a milligram per cigarette basis.

### 4. Menthol

Menthol is determined in smoke (TPM pads), filler and filter plugs by gas chromatography of an ethanol extract. The samples are compared to standards of known concentration. Carvone is used as an internal standard in the extracting solution to eliminate instrument variation. Sample injection, chromatogram analysis, and data manipulation are automated. For menthol in smoke determinations, eight ports (five cigarettes per port) are smoked for each brand. The cigarettes are smoked to a 23 mm butt length or tipping + 3 mm (whichever is longer). Two TPM pads are combined and extracted in the 95% ethanol extracting solution. The sample for the filler and filter analyses represents a composite sample of twenty cigarettes randomly selected from the same packs used for menthol in smoke analysis. The composite sample is analyzed in duplicate.

### 5. Filter Efficiency

Eight ports of TPM are smoked by the direct filter weight method to determine filter efficiency. This involves cutting off the filters, weighing them, and reattaching them to monitor tobacco rods using a glass sleeve. This procedure permits the same amount of smoke to be presented to the filter. Reweighing the filters after smoking yields the weight of filtered material. Filter efficiency can then be calculated. The filter efficiency values for carbon filter cigarettes are slightly higher than for CA-type filter cigarettes because of the added weight contributed by the carbon pick-up of gas phase components.

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6. Filler Rod TPM

Filler rod TPM is the TPM generated when 55 mm of a tobacco rod is smoked to a 10 mm tobacco butt. In this test, all cigarettes are cut to a 55 mm tobacco rod length regardless of the initial cigarette length. In the case of filter cigarettes, the filter plug is cut to 15 mm and the filter material is removed. If the cigarettes are diluted, the ventilation holes are covered prior to cutting the filter. In the case of nonfilter cigarettes, a 15 mm plastic tube is taped to the cigarette rod to provide equal holding characteristics for smoking. A total of 8 ports (32 cigarettes) is smoked per sample.

7. Puff Count

Puff count is determined by counting the number of puffs required to reach designated butt length during the TPM analysis.

8. Carbon Monoxide (CO) Deliveries in Cigarette Smoke

Five cigarettes are smoked for each determination. The cigarettes are smoked simultaneously on a five-port smoking machine using standard smoking specifications. The gas phase sample stream is automatically split by a series of gas sampling valves. An aliquot of the vapor phase is pumped into a non-dispersive infrared spectrophotometer for CO detection. Two replicate determinations are performed for each sample. Gas phase is defined as the smoke which passes through a standard Cambridge filter pad. This procedure determines CO on a puff-by-puff basis. The results are obtained on a per cigarette basis by the summation of the per puff values.

9. Nitric Oxide (NO) Deliveries in Cigarette Smoke

Nitric oxide (NO) in the gas phase of cigarette smoke is determined by a chemiluminescence reaction. A aliquot of gas phase smoke is drawn under vacuum through an Oxides of Nitrogen Analyzer which monitors the chemiluminescence reaction of nitric oxide (NO) and ozone (0.3). The NO delivery is quantitated by comparison to standards of known NO concentration. The data are reported on a mg/cigt. basis.

10. Gas Phase Smoke Index

The smoke index (S.I.) represents the efficiency of a charcoal filter for the removal of the cyanides and total aldehydes component from the gas phase. The S.I. is determined by a plug-in and plug-out smoking procedure. Smoke Index is the combined average percent reduction of cyanides and total aldehydes. The higher the S.I. value (maximum = 100), the greater the filter efficiency for cyanide and total aldehydes removal.

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B. Resistance-To-Draw (RTD)

Resistance-to-draw [expressed as mm of water (hydrostatic head)] is defined as the pressure drop across a cigarette with an air velocity of 1050 ml/min. This is determined by inserting the end of a cigarette into a specially designed tube through which air can be drawn. The pressure difference between the open and enclosed end of the cigarette is measured. The apparatus is calibrated by means of a standardized capillary tube of known pressure drop. Five randomly selected cigarettes are measured per carton for a total of fifty determinations per brand.

C. Static Burn Rate

Static burn time is the number of minutes required for 40 mm of the tobacco rod to burn in a device which measures the time automatically. Eight cigarettes per brand are randomly selected from the C.I. sample.

## III. CIGARETTE CONSTRUCTION

### A. Paper

#### 1. Porosity

Porosity of cigarette paper is defined as the time in seconds for 50 milliliters of air, under arbitrary pressure conditions, to pass through a 0.786 square inch oval area of paper. Three cigarettes are selected per carton for a total of thirty cigarettes per brand.

#### 2. Paper Component

The substances added to paper to control the rate of burning are determined quantitatively on an extract of the paper. Phosphate is determined by the colorimetric molybdovanadate reaction. Citrate is determined by the gas chromatographic analysis of the methyl ester formed by reacting the paper extract with a solution of sulphuric acid in absolute methanol.

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B. Circumference

Circumference is measured with a Techmet LaserMike Circumference Micrometer. The cigarettes to be tested are placed in the hopper which automatically positions the cigarette in the path of a low power laser beam. The circumference measurement is a function of that portion of the laser beam which is blocked out. During one circumference measurement, 100 readings are taken per revolution. An internal microprocessor computes the circumference and the results are reported in mm. Thirty cigarettes are measured per brand.

C. Weight of Tobacco

Twenty cigarettes are randomly selected from each of ten cartons. The tobacco portion only is weighed. The weight of tobacco per cigarette is calculated and corrected to a 12.5% moisture basis.

D. Cigarette and Tobacco Rod Length

The length of a cigarette paper is measured on a specially designed instrument. Lengths are measured accurately to the nearest 0.1 mm. Ten individual cigarette papers are measured per brand. The rod length is the difference between the cigarette length and filter length.

E. Tipping Paper Length

Ten cigarettes are randomly selected and the tipping paper is measured with a millimeter scale divided into 0.5 millimeter increments.

F. Filter Plug

1. RTD, Ventilation, Length, and Weight

The same cigarettes which are used for total RTD are used for these measurements. To measure ventilation, a sliding glass sleeve connected to a digital ventilation meter is moved into position over the ventilation holes in the filter. The percentage of air that is drawn in through the holes diluting the mainstream of air passing through the cigarette rod is read directly off the meter. The plugs are then separated from the rods, and individual measurements of plug RTD are made. The plug RTD is an encapsulated measurement eliminating the effects of ventilation.

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1. RTD, Ventilation, Length, and Weight (cont.)

The length of each plug is measured to the nearest 0.1 mm using a linear output transducer connected to a digital meter. The filters from five cigarettes per carton are measured to yield an average plug length. The filter material, without plug wrap, is then weighed to the nearest 0.001 g.

2. Fiber Denier

Ten cigarettes are randomly selected from cartons representing a place of manufacture. The plugs are opened, and a sample of fiber is removed from each. The samples are combined, rolled into a bundle, embedded in paraffin, sectioned on a microtome, and mounted on a microscope slide. Using a microscope projection system of 1000X magnification, a tracing is made of ten fibers selected at random from the section. The areas of ten fibers are measured, averaged, and the denier is calculated. The cross section is referred to by shape; that is, regular shape (R), I-shape (I), and Y-shape (Y). This test is performed only when a change is noted in a cigarette filter.

G. Carbon

Carbon is determined on filter plugs by dissolving the supporting filter materials in an appropriate solvent and drying the remaining carbon for one hour at 250°C. Five plugs are used per determination and the values reported are the average of four determinations in mg carbon/plug.

## IV. FILLER COMPOSITION

A. Total Alkaloids and Total Reducing Sugars

Reducing sugars and nicotine alkaloids are extracted from cigarette filler with an aqueous acetic acid solution and determined colorimetrically using an Auto-Analyzer. Alkaloids react with cyanogen chloride in the presence of an aromatic amine to produce a color proportional to the alkaloid concentration. Reducing sugars are determined by their reaction with p-hydroxybenzoic acid hydrazide (PAHBAH) in a basic medium to form a color. Samples are compared with 1:1 glucose-fructose standards. All data are reported on a dry weight basis.

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B. Reconstituted Tobacco and Expanded Stems

The amount of reconstituted tobacco and expanded stems (ES) is determined by physically separating these components from the filler using a microscope and weighing the fractions. The brand sample consists of a group of nine cigarettes sampled from the available cartons. The center third of the rod of each cigarette is cut out and the sections are combined into three groups of three sections each. The tobacco of each group is removed, and the above separation is made.

C. Expanded Tobacco

The filler from 18 cigarettes is placed in acetone. The expanded tobacco and the non-expanded material is separated, oven or air-dried, and weighed. The expanded tobacco percentage is calculated. This method was adopted as the standard procedure for expanded tobacco in June, 1980.

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